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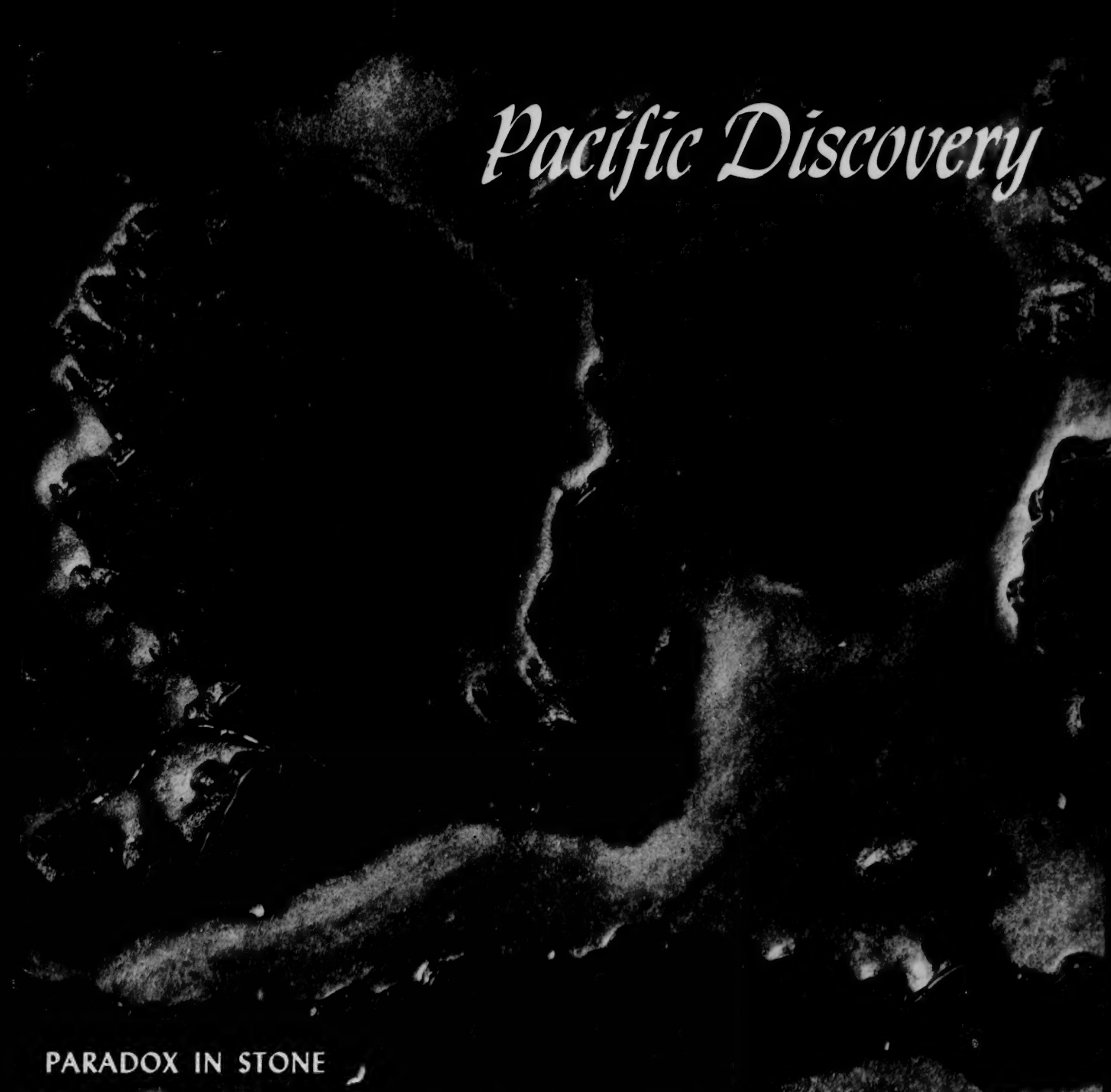

PARADOX IN STONE

PUBLISHED BI-MONTHLY BY THE CALIFORNIA ACADEMY OF SCIENCES

IN THIS ISSUE: *Woodbridge Williams*
Henri Louis Comte de Gueydon • *Gayle Pickwell*
Borys Malkin • *A. Starker Leopold*

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Pacific Discovery

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Pre-Discovery:

This issue closes Volume I. As it goes to press the Editors are—what with Christmas traffic jams in printing and post offices—confessedly too conscious of Volume II Number 1's double-column and half-tone shadow on the road ahead, to pause for much reflection. Will readers please do that for us? A gratifyingly large number, this first year, have acted on the principle that it takes subscribers to make a magazine. It would be of great help to us in planning the next issues if many more of *PD's* readers would write to tell us their reactions to Volume I as a whole, or to particular issues. The letters we've had were, almost without exception, the kind that make editors dangerously complacent. The exceptions were joyously welcomed and printed under a display head: controversy, we noted before, keeps things lively. A lively "From the Reader" page we'd like to see in *every* issue. But the letter you thought of writing and didn't never gets printed. Perhaps a good time to write would be when you renew your subscription. Your suggestions and criticisms will help make *PD* continually better.

Eleven years ago our Conservation Editor, A. Starker Leopold, explored one of the last great wilderness areas of southwestern North America, in the Sierra Madre Occidental of western Chihuahua, Mexico. Here, 200 miles southwest of El Paso, Texas, were vast forests, rugged uplands, game, wildlife abounding, evidences of ancient hunting and agricultural man. Modern man was sparse on the area's periphery, absent within it. Last summer Dr. Leopold went in again, with others of the staff of the University of California's Museum of Vertebrate Zoölogy. They found wilderness, game, the grandeur of rugged country—but they found them shrunken, remnant of what was. Modern man is closing in—with logging trucks, sawmills, fire. The story Dr. Leopold tells, next issue, is one of adventure, discovery—and of vanishing wilderness.

Discovering PD's Authors:

At home in tide pools himself, **Woodbridge Williams** was well qualified to recast Dr. K. O. Emery's paper, "Marine Solution Basins" (*Journal of Geology*, July 1946) into a "Paradox in Stone," technicalities cut to common measure. The job belonged to Woody, moreover, by virtue of his camera skill; he shot pix for "Paradox" while engaged in advanced studies in marine biology at Scripps Institute of Oceanography, La Jolla, from which Dr. Emery contributed his paper. Woody Williams is now a biologist in the Academy's Steinhart Aquarium.

The **Comte de Gueydon** brought to the hydrographic survey of Cocos Island, a century ago, that preciseness of mind said to be typically French, and a gift of expression which makes his *rapport* scientific literature. The Academy's **Joseph R. Slevin,** whose interest in the history of Galápagos discovery and exploration exhumed from French Admiralty archives *Le Génie's* reports of her visits to those islands and to Cocos, has found little on that brig-of-war's commander, except that he was born in 1809, was commissioned ensign in 1830, captain in 1847. Translator of "Report on Cocos," Dr. **Tracy R. Kelley** is philologist, teacher, writer, editor, and lifelong student of scientific literature.

One of the largest and finest files of Western nature photographs we know is Dr. **Gayle Pickwell's.** With "The Pines of California" the retired Professor of Zoölogy in San Jose State College brings again to our pages his versatile camera-pen combination.

Our anthropological, entomological Academy Research Associate, **Borys Malkin,** took many "Trails out of Tripoli" before the authorities caught up with him. Seems he forgot to register on debarking in that North African port.

We asked **A. Starker Leopold** to review William Vogt's controversial *Road to Survival* for this issue. While he was working on it, *Time* took a 5-page crack at the "neo-Malthusians." So "Of *Time* and Survival" is an editorial. Dr. Leopold is not ashamed of being a conservationist.

D. G. K.

EDITORIAL:

MIDWAY IN THE YEAR that is drawing to a close, on June 21, 1948, there died in St. Andrews, Scotland, an elderly zoölogist of whom it might be said far more truly than of that "noblest Roman" of whom the words were written:

> His life was gentle, and the elements
> So mix'd in him that Nature might stand up
> And say to all the world "This was a man!"

D'Arcy Wentworth Thompson lived in the superlative. Wisest, wittiest, most versatile of scholars, he was also one of the most durable; his tenure of professorships in institutions of higher learning extended continuously over a period of sixty-four years. At one end of his long life he was contemporary with Darwin, Pasteur, and Helmholtz, at the other with Einstein, Lawrence, and the atomic age. He witnessed the whole development of modern science, and not only witnessed it but participated in it and helped to chart its course.

Born May 2, 1860 in Edinburgh, he received his early education in that city, and at the age of seventeen entered the University of Edinburgh to study medicine. Here he came under the influence of Sir Wyville Thomson, lately returned from the *Challenger* Expedition, who turned his interest toward marine biology and oceanography. Two years later he transferred to Cambridge, where he supported himself by coaching in Greek until he obtained a post as demonstrator in physiology.

At the early age of twenty-four he was appointed to a professorship of biology in the University College in Dundee. Thirteen years later, in 1897, the University College, and Professor Thompson along with it, became integrated with the University of St. Andrews. Here, through more than half a century of distinguished service, D'Arcy Thompson graced the faculty of Scotland's oldest university.

"Tall, bearded, venerable and kindly," wrote the Edinburgh *Scotsman* in commenting on his passing, "he had an unconquerable zest for life and adventure. . . . Generations of students regarded him as the embodiment of all that a professor should be, and his wide scholarship, vivid personality, freedom from pedantry, and notable wit and vigor, marked him out from the usual run of professors of these days when a chair is too often the seat of a specialist of narrow range."

Professor Thompson had many friends on the Pacific Coast, among them our own Alice Eastwood, who met him at a science congress in Paris some years ago, and found him keenly interested in San Francisco (his father, a master in the Edinburgh Academy, had been a teacher of Robert Louis Stevenson). In 1936 a gentleman from Seattle visited Professor Thompson, who inquired after the health of Professor Trevor Kincaid of the University of Washington, and then remarked with a twinkle in his eye, "When you see Professor Kincaid again, tell him I'm still waiting for an answer to that letter I wrote him in 1909." And if any excuse be needed for introducing a Scottish professor to the columns of *Pacific Discovery*, D'Arcy Thompson started his own Pacific discoveries in 1896 and 1897 when, as a member of the British-American inquiry into the fur-seal industry, he made two voyages to Bering Sea.

But it is not for any reason yet mentioned that we are editorializing on D'Arcy Thompson—not because he was precocious in his youth and venerable in his age, nor because he was a great teacher, nor because he was acquainted on the Pacific Coast. It is because he represented, and exemplified throughout his whole career, a type of mind, a depth of insight, a breadth of scholarship, and a point of view, that are in danger of disappearing from our way of life.

D'Arcy Thompson was opposed to specializa-

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★

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tion, regarding it as a self-imposed and stultifying limitation on the human mind. The professorship he occupied at St. Andrews was that of Natural History, and we venture to guess that it retained that name because he wished it. "In these days of specialization," he used to harangue his students, "there are no longer any naturalists. A man becomes a protozoölogist or a helminthologist or some other kind of ologist, and he forgets what it was he started out to study!"

Natural History, it should further be remarked, is—or was according to D'Arcy Thompson's interpretation – substantially synonymous with the whole field of human knowledge. Men, along with other animals, he reasoned, and with plants, bacteria, and filterable viruses, live in a physical environment exerting constant and determinable forces. Therefore the physical world must come within the purview of the naturalist. Moreover, since men are organisms, everything they do or think is Natural History.

This catholic interest in things in general might, in a lesser mind, have led to vagueness and to endless puttering. In D'Arcy Thompson it led to an amazing wealth of accomplishment. He served forty-one years on the Fishery Board for Scotland, forty-six years as a British representative on the International Council for the Study of the Sea. He wrote a long series of scientific papers and reports. Early in his career he published *A Glossary of Greek Birds,* and fifty years later *A Glossary of Greek Fishes.* Somewhere in between he translated and annotated Aristotle's *Historia Animalium.* He served as president of the Royal Scottish Geographical Society, the Royal Society of Edinburgh, the Royal Physical Society of Edinburgh, the Scottish Classical Association, the Classical Association of Great Britain. He was Herbert Spencer Lecturer at Oxford in 1913, Huxley Lecturer at the University of Birmingham in 1917, and Lowell Lecturer at Harvard in 1936. His degrees and other honors ranged, as one biographer has phrased it, from Aberdeen to Johannesburg, and from Boston to Delhi.

"In his mastery of all the Arts," again we quote the *Scotsman,* "he rivalled the great figures of the Renaissance." Refusing to specialize in any field, he became in fact a specialist in many. Claiming no province as his own, he freed himself from narrow limitations. His was a mind to venture, to explore, a mind that swept and surged, forever restless as the sea he loved.

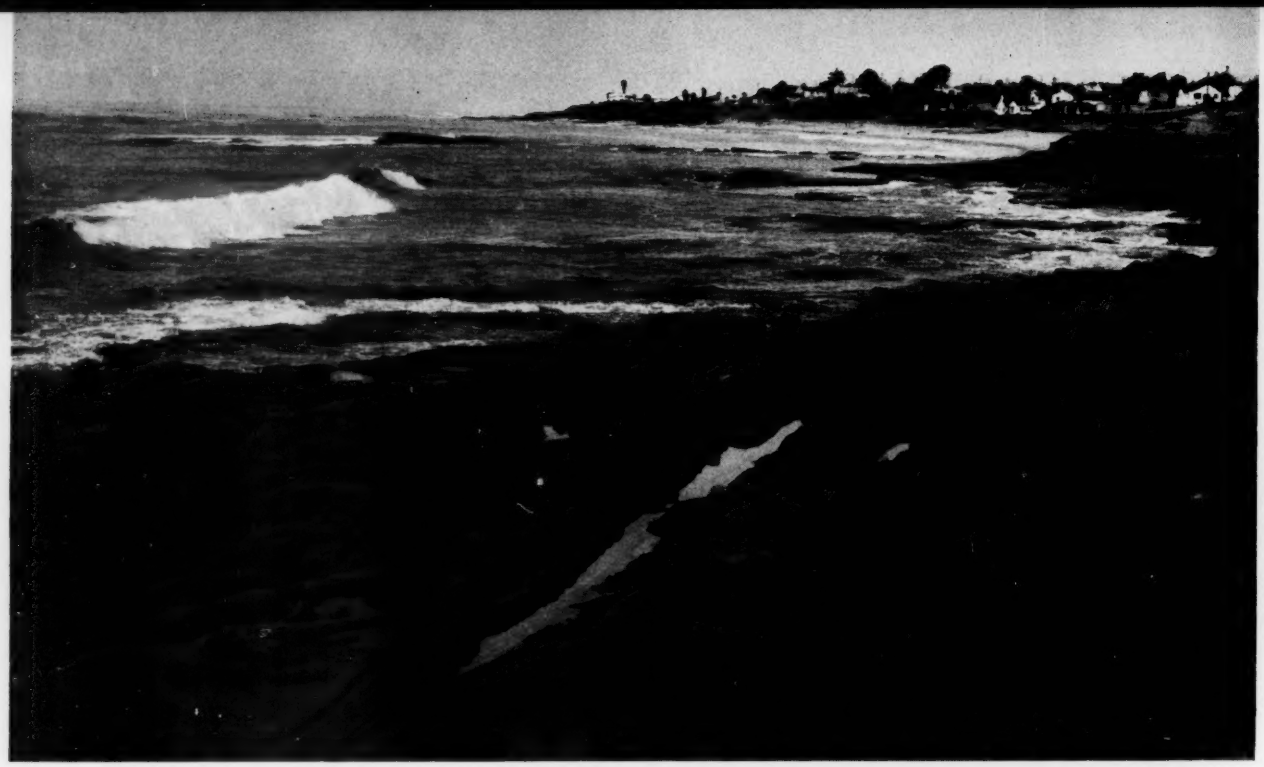
When he was somewhere around fifty, this amiable generalizer – this unorthodox professor who mixed botany and zoölogy together, added physics and mathematics, seasoned with philology, philosophy, and history, and stirred with a large spoon—sat down and wrote one of the great books in the literature of biology, *On Growth and Form,* a recondite work of around eight hundred pages (revised edition, Macmillan, 1942, 1116 pages) which the author modestly refers to as a "preface" to the subject.

Speaking of "this remarkable work," Professor W. T. Calman of the British Museum refers to "the perfect pellucidity of its writing," a comment that enhances our already high esteem for Professor Calman's scholarly attainments, but does not make the book any easier reading. As a matter of fact, most readers will find it rather heavy going, not because Professor Thompson lacked the ability to express himself with pellucidity and grace, but because it is not always entirely clear what language he is writing. In the first chapter of *Growth and Form* we find the following number of words, phrases, sentences, or longer passages in languages other than English: Latin, 21; Greek, 12; French, 18; German, 8; Italian, 3. And he who labors through the several languages of Chapter I finds himself confronted in Chapter II with yet another, the precise, austere, and esoteric speech of mathematics (we forgot to mention that Sir D'Arcy was also an honorary member and president of the Edinburgh Mathematical Society!). Nevertheless, with all its hazards for the unwary, *Growth and Form* is a great book, a work of permanent importance for the study of organic form, and a work that in its range of scholarship is without parallel in our times.

To convey a little of the flavor of this book, and of its author, we can do no better than to quote its final paragraph, an appreciation of Henri Fabre which, with only the change of a word here and there, might serve as the fitting epitaph of Sir D'Arcy himself:

"But with no less love and insight has the science of Form and Number been appraised in our own day and generation by a very great Naturalist indeed—by that old man eloquent, that wise student and pupil of the ant and the bee, who died while this book was being written; who in his all but saecular life had tasted of the firstfruits of immortality; who curiously conjoined the wisdom of antiquity with the learning of today; whose Provençal verse seems set to Dorian music; in whose plainest words is a sound as of bees' industrious murmur; and who, being of the same blood and marrow with Plato and Pythagorus, saw in Number *le comment et le pourquoi des choses,* and found in it *la clef de voûte de l'Univers*"—the how and the why of things, and the keystone of the Universe.

R. C. M.



At La Jolla, California, a short distance north of San Diego, high tidal rock basins form fantastic patterns along the rim of the sea. How these "solution basins" were formed was a puzzle for both geologists and biologists.

Woodbridge Williams

PARADOX IN STONE

AN INTERESTING PHENOMENON of the California coast exists at La Jolla, a few miles north of San Diego, where high-tidal rock basins form fantastic patterns along the rim of the sea. These basins occur on flat, calcareous sandstone benches which drop off sheer on the seaward side, and landward slope gently toward the bluffs. They range in size from tiny pits to basins just right for a baby's bath. Many of them have raised rims and circular outlines like the craters of the moon. A few basins have been converted into genuine potholes through the abrasive action of loose rocks; but this process, so typical of fluvial stream erosion, is only a secondary factor in the complex origin of the basins at La Jolla. Only within recent years has the history of these been well understood.

Between 1937 and 1946 Dr. K. O. Emery, now of the Geology Department of the University of Southern California, spent his vacations and holidays at the Scripps Institute of Oceanography studying the La Jolla basins. His first observations brought to light a curious paradox.

The fluted sides and flat bottoms of the majority of the basins suggested to Emery that the concavities had been formed by solution. This meant to him that the rock cement, calcium carbonate, which bound the grains of sand together in the sandstone, was dissolved by sea water, and the sand grains loosened, later to be washed away by the surf. These observations did not give a complete picture, however; under normal conditions sea water is saturated with calcium carbonate and therefore unable to dissolve the rock cement. Emery also noted the raised rims of many of the basins which indicated to him a process of deposition of calcium carbonate rather than solution. It was only after careful examination of the effect of biological activity on the standing water in the basins that he was able to resolve these difficulties.

He found that the solution basins contained populations of intertidal plants and animals which lived most of the time in still water as the pools were refreshed but once or twice daily, at high tide. Consequently, the basins became balanced marine aquaria and, as in the synthesized home and school models, the water in these natural aquaria became subjected to chemical changes through the biological activities of the plants and animals.

One might recall that in the home aquarium the green plants under the influence of sunlight give off bubbles of oxygen; at the same time the plants utilize carbon dioxide in the water and water itself to manufacture food in the form of carbohydrates. This is the process called photosynthesis, and it was photosynthetic activity of the green algae in the solution basins that Emery found to be responsible for the major changes in the water of the pools during the day.

In brief, he found that the plants were removing carbon dioxide from solution more rapidly than respiration of the organisms in the basins could replace it. This dissolved carbon dioxide existed as carbonic acid whose concentration governed the solubility of calcium carbonate. With the depletion of carbonic acid, augmented by evaporation, calcium carbonate began to settle to the bottom of the basins. Most of the precipitate was washed out of the basins at the next high tide, but some of the calcium carbonate found its way into the rims through capillary action. The addition of this compound to the rims increased their resistance to erosion over that of the surrounding sandstone. It was surmised that this sandstone weathered more rapidly than the rims, and in consequence the rims were eventually left standing in relief above the general surface of the sandstone benches.

Emery next discovered that at night the opposite effect was produced. As the sun set, photosynthesis ceased. Yet both plants and animals continued to respire and give off carbon dioxide which dissolved to form carbonic acid. This increased acidity in turn enlarged the capacity of the sea water to hold calcium in solution. In contrast to its daytime condition, the water was no longer saturated with calcium. It had become a solvent and now was able to dissolve calcium carbonate from the rock walls of the basins in the form of highly soluble calcium bicarbonate. This Emery proved by careful measurements, both night and day, of the changes in the concentrations of carbonic acid, bicarbonate, and carbonate components.

Thus the paradox appeared solved. Emery's results bore out the original guess that solution must take place. Also substantiated were his observations that deposition occurred, but it was impossible for the two processes to function simultaneously. For deposition occurs during the day when the water is alkaline, solution at night when

Photographs by the Author

The La Jolla basins occur on flat, calcareous sandstone benches which drop off sheer on the seaward side, sloping landward gently toward the bluffs. Only the highest tides reach them to renew their water.

it is acid. These changes take place in standing sea water subjected to biological activity. Of all the forms of life involved in this sequence Emery found that the most important was a small black snail.

Known to taxonomists as *Littorina planaxis,* called "periwinkle" by many laymen, this snail is a member of a large genus which is abundant in the high tide zones of many shores. This species is extremely plentiful near high-water mark in California. Emery discovered that in the basin area at La Jolla solution took place more rapidly where these snails congregated in pockets. Wherever they gathered more carbon dioxide was formed and thus an acid condition was created which accelerated the solution of the rock mortar in the sandstone. He also found that *Littorina* played a part in the physical erosion of the rock.

Emery noted that a great deal of sand was excreted by the snails. He took some specimens to Dr. Wesley R. Coe, former Professor of Zoölogy in Yale University, who is spending his years of retirement at Scripps Institute, working intensively on the life histories of marine mollusks. Dr. Coe found that the intestines of the snails were jammed with sand grains and blue-green algae which were assumed to have been rasped from the walls of the basins with the snails' file-like radulas. Emery confirmed the source of the sand grains by a careful comparison in size and structure with the grains of sand in the sandstone. The sand in the snails' intestines was very similar to the sand in the walls of the basins, and not like the sand of the nearby beach which would have been the only other source. He estimated that on a sandstone bench 33 yards wide by 110 yards long the snails are capable of eroding 1,100 pounds of sandstone each year. Consequently they are active agents in the formation of solution basins and a contributing factor to the general erosion of the local coast line.

Thus it was discovered that plants, through their utilization of carbon dioxide in photosynthesis, caused deposition of calcium carbonate and the formation of the raised rims during the day; while both plant and animal respiration, especially that of *Littorina planaxis,* created an acid condition

ABOVE: *An infant solution basin brimful of periwinkles, Littorina planaxis. This snail was the most important of living forms involved in the complex process of shaping the solution basins.*

RIGHT: *The basins range in size from tiny pits to babies' bathtubs. Pictures of them often resemble the enlarged photographs of the moon's craters.*

Matured solution basin. It is populated by a more abundant fauna and flora. Notice the growths of green filamentous algae, the presence of another snail—a turban, Tegula gallina, and young basins forming along the edges of the old. This basin is probably much more than 200 years old.

at night, causing the rock cement to go into solution, and bringing about the enlargement of the basins.

Emery estimated that a basin averaging two inches in depth was more than 200 years old. He calculated that the pools deepened one centimeter, or a little less than one-half inch, every 33 years. Many of the lower pools were deeper than two inches, and also much older than 200 years. Some of these had been drained by down-cutting which occurred when water thrown up by the surf rushed back toward the sea, eventually cutting a system of passageways. Secondary solution basins were also often formed within older basins, and frequently the basins had coalesced to form tiny canyons, and miniature valleys with fluted sides. Because of this complicated pattern, Dr. Emery was unable to estimate the age of the solution basin area as a whole.

He pointed out, though, that this phenomenon is rare along the shores of the United States, owing to the lack of calcareous sandstone outcrops. There is an exception at Key West, Florida, where he found a few scattered basins. Solution basins have also been reported from such far-flung points as Bermuda, Hawaii, Ulithi Atoll, New Guinea, and Vancouver Island. Basins attributed to solution are also found inland, such as the shallow basins in the limestones of western Texas, called *tinajitas*, and even igneous rocks contain basins probably the result of solution. They have been reported in the Sierra Nevada where small basins are present in quartz and granite. These are thought to be formed when the less resistant minerals are dissolved by rain water acidified by the decaying vegetation. Of course solution is one of the processes eroding to some extent all rocks in nature. This process is especially active in limestone areas where caves, underground rivers, and sinks are common.

Emery suggested that the La Jolla solution basins started with small ponds left in the joints, depressions in the rocks, and other vulnerable spots. After a few inundations by the sea an intertidal plant and animal population established itself, its origin the always bountiful marine plankton brought in by the waves. Once life settled in the basins, a natural chemical laboratory went to work and etched out the curious rock structures which have proven to be such a fascinating study. Emery's work indicates that not all intriguing problems of the sea lie in the depths.

Henri Louis Comte de Gueydon

REPORT ON COCOS

Translated by Tracy R. Kelley

DEPARTMENT OF THE NAVY AND COLONIES
BUREAU OF MAPS AND PLANS
STATION OF OCEANIA

Le Génie, at Sea, 14 November, 1846

ADMIRAL:

After nine days sail—very monotonous, the sky all the time overcast or at least cloudy, the sea fairly quiet, the wind holding light and steady between S and SSE with never a shift to break the tedium—*Le Génie* came up to some thirty leagues off Cocos Island. The sky now changed—the wind veering westward—and the weather grew squally, with a lot of rain, though we did not have to shorten sail; only, as long as the squalls lasted, the wind blew WNW and made us sail close-hauled.

The evening of 31 October land was sighted dead ahead, just about where the island should be; and since the look-out gave it the same shape as I had in my own mind I credited his report, although according to my judgment the distance was still too great to bring the island into sight. Shortly after, squalls cut off the view and made verification impossible. Anyhow, being afraid we might be in error, I slowed down so as to keep from running past anchoring-ground in the night and having, the next day, to fight wind and current.

At daybreak, 1 November, we made out land perfectly, about ten leagues away, S40°E, but its look was so different from what you gave me that for a moment I would not believe my eyes. It shows up flat throughout almost its whole length; its extremities are cut off sheer; and it is only in the SW part—which on our first view lay under clouds—that there stand three small pointed hills. It must be then that Commander Lecointe, who represented the island as three sharp peaks, was mistaken at least about distance. Probably he stood off 24 leagues, not 24 miles, when he made his sketch. At the greater distance, corresponding to my position when the look-out reported land, you are quite likely to see only the three summits,

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After the Schooner *Academy* had completed her 1905-1906 voyage of scientific research to the Galápagos and so had taken her due place on the roster of ships—discoverers, explorers, men-of-war, buccaneers, merchantmen, whalers, colonizers, floating oceanographic laboratories, *et al.*—which had dropped anchor in the bays and roadsteads of those "Enchanted Isles," I, as chronicler of that first California Academy of Sciences Galápagos Expedition,* became deeply absorbed in the pursuit of our predecessors to those anchorages. Among them was *Le Génie,* whose signature we had seen on Cocos.

In earlier days it was customary for ships to leave their names and the dates of their visits at their various anchorages; Cocos Island, famous watering place for treasure hunters, buccaneers, and men-of-war, bears a roster dating back to 1797, when H.B.M. Schooner *Les Deux-Amis* registered her arrival. Carved in a boulder on the beach in Chatham Bay is the name of *Le Génie,* a French brig-of-war which in 1846, under command of Henri Louis Comte de Gueydon, surveyed Cocos' waters. A photograph of this boulder was given me by Captain Allan Hancock, whose guest I was on his first cruise to the Galápagos (my second to those islands, and Cocos as well), in 1927.

This photograph I sent to Dr. Paul Chabanaud of the Muséum National d'Histoire Naturelle in Paris, a correspondent of the Academy's Department of Herpetology, with an inquiry as to whether mention of *Le Génie's* voyage appeared in any works on natural history. Finding no such references but evidently becoming interested in *Le Génie's* own history, the Doctor took my photograph to the French Admiralty Office where was produced forthwith her commander's original report to his superior, Rear Admiral Hamelin, Station of Oceania. By courtesy of the Admiralty, transcriptions of the reports of *Le Génie's* visit to Cocos and to the Galápagos are now in the Academy's files. The Cocos transcription is superscribed: *"Copie d'un rapport addressé à M. le Contre-Amiral Hamelin, par M. le Comte de Gueydon, Capitaine de Corvette, Commandant le brick 'Le Génie,' sur sa relâche à l'île des Cocos en Novembre 1846."*

Publication of this scientific report—such we may call it—awaited competent translation and a suitable medium for carrying it. The translator, Dr. Tracy R. Kelley of the University of California, Berkeley, has kept the flavor and spirit of the original; *PD* is indeed a suitable medium for bringing it to all who are interested in Pacific discovery. JOSEPH R. SLEVIN

Log of the Schooner "Academy" on a Voyage of Scientific Research to the Galápagos Islands 1905-1906. By Joseph R. Slevin, OCC. PAP. CALIF. ACAD. SCI. No. 17. California Academy of Sciences, San Francisco. 1931.

Cocos on the port bow! Eighty years after Le Génie, Captain Allan Hancock's ship, the Oaxaca, stands in toward Chatham Bay. (Photograph courtesy Captain Allan Hancock)

which, however, do not from any direction appear to be much higher than the adjacent ridges.

As soon as I was right sure of my position I crowded sail in order to come closer; and I kept going, certain I had plenty of sea-room, in spite of a torrential rain coming up and hiding the island from sight. At 11 o'clock, the rain having stopped, the island came into sight again, a little way off. I then made out perfectly the islets and rocks off the SW point and could examine at my leisure this part of the shore line—for the wind had a good deal abated. A little later it came up again, and I took advantage of it to keep the shore well aboard and look for anchorage.

Swells were breaking with force on the beach facing SE; but as we got beyond the eastern point the sea grew more and more quiet and it did not take me long to find the bay described by Vancouver with such striking accuracy that without delaying to investigate I entered boldly and dropped anchor in 23 fathoms on a muddy sand bottom.

It being too late in the day to start hydrographic work, I put off with a party of my officers to get acquainted with the land. The first thing that struck my eyes was a solitary rock on the sand beach where we had come ashore; and on this rock I discovered, among numerous deep-cut inscriptions, the names of the ships under Vancouver's command, incised above these words: "Looky as you goe for ye ſ of coco." The characters "ye ſ of" are badly put in and are almost obliterated, so it is possible or even probable that we have misread them; still, Vancouver says they were already in this condition when he visited the island 25 January 1795. As to the sign following the word "look," which in 1795 gave rise to various interpretations, it now seems to me quite beyond doubt that Cocos is the very island so named by Clipperton. I venture therefore to say that the sign ϒ was designed expressly to represent a coco-tree. This accepted, I would explain the inscription thus: "Take a look when you come to *the tree that has this shape* (or *to this coco-tree*), *because it bears* coco-nuts," or "because this is why my name is Coco."

A little way from this rock, in a ravine between two steep hills, there runs a stream—often a torrent—whose bed is choked with large, bare, round-cornered blocks of stone. These rocks are covered with inscriptions—clear evidence that Cocos Island is often visited. Still, there is nobody settled there, nor does it look as if anyone put in except for wood and water.

Curiosity and the pursuit of information led me to spend the whole evening exploring the roster of our predecessors. I should have liked to come upon some French names; but—alas for French shipping!—close scrutiny left me grieved at finding on every rock only English or American names.

Le Génie's signature on the beach at Cocos. (Photograph courtesy Captain Allan Hancock)

Names of several English war vessels were found, beginning with *Discovery* and *Chatham,* under Vancouver, then Sher [*sic,* Schooner] *Les Deux-Amis* visited the island 29 September 1797; and last H.B.M. *Sulphur* and H.B.M. *Starling,* which must have charted the coast line, for cut into the stone, alongside their names, is the outcome of their observations.

According to *Sulphur* and *Starling:* Latitude is 5°33′; Longitude, 87°02′; variation, 8°20′NE.

According to Vancouver: Latitude is 5°35′12″; Longitude, 86°54′ Greenwich; Variation, 8°.

According to *Le Génie:* Latitude is 5°32′50″; Longitude, 89°22′28″ Paris.

Our latitude is not so reliable as I should like to have it; for during the five days we were at anchor the sun did not show for a moment around noon. It was only on the day we left—and we were already under sail—that an observation could be taken; but as I then found I was very near the only reef, there, in my knowledge, our determined latitude at least enabled us to fix the position of that danger spot. Referred from this position to the bay where the others took observations, our latitude agrees with *Sulphur's.*

This, above, does not record my only disappointment. Throughout the two days following my arrival it rained so heavily and so steadily as to make all work impossible. When I was beginning to lose hope of sending you any hydrographic reports, the weather turned at last into mere squalls; and then, taking advantage of the good spells, the officers to whom I had committed the charting of the two bays were able to do the triangulating and finish up the soundings that with praiseworthy zeal and energy they had begun under a pouring rain.

While Messrs. Collos, Jamin, and Meynard were at their surveying, my carpenters went into the woods to look for a tree from which they might make an anchor-stock to replace the one I lost at the Galápagos and, as you know, could not replace at Callao. Prudence demanded that I put all my anchors into good shape for so long as I should be held in Central American waters. As for myself, I did some exploring ashore with those of my officers who were not engaged in hydrography. As you shall soon see, our task was not at all difficult.

On the 6th of the month—after a stay of less than five days, my anchor stock now ready and the survey of the two bays done—I got under sail immediately after the crew's breakfast to circle the island and complete the hydrographic work. Back to where we had started, I found that the currents had affected the reckoning very considerably (11.1 m. N70°E). Bearings taken on well established points enabled M. Collos to rectify the course; yet it is possible that a few slight errors have slipped into our coast-line detail.

Now that I have rendered an accounting of my time, and of the difficulties that compelled me to

Wooded bluffs of Cocos Island, at Wafer Bay. Every landing party on this Pacific rendezvous of buccaneers has been met by this formidable tangle of trees, grasses, ferns, and vines. (Photograph courtesy Captain Allan Hancock)

prolong my stay beyond my own desire (though not a minute too long), it remains for me to break down my own observations, and such as I have picked up, so as to give you a picture of Cocos Island—but without letting myself be afraid of saying again what may have been said by others.

Cocos Island lies very nearly NE and SW. In this direction it is 4.90 miles long. Its greatest breadth, NW and SE, is 2.61 miles.

From the western point—which is guarded by a group of islets and rocks that look very steep and are not so far from the shore as Vancouver puts them—the coast line, very slightly rounded, runs S58°E 2.26 m. It then turns abruptly, making here the island's southernmost point, which I have named Point Dunois in memory of the ill-fated ship I once commanded.

At 1.1 m. from land and 1.5 m. S68°W from Point Dunois there stands between wind and water a sharp-pointed rock on which the sea breaks with force. It is very steep. I passed it a cable's length S.

Beyond Point Dunois the coast draws in a little, then sets out again almost in a straight line for 2.98 m. in the direction N53°E to form a new point, the island's easternmost. Between this and Point Dunois are three islets only a little distant from the mainland. One of them, indeed, which stands in the bight I have just spoken of, does not seem from any side to be detached.

Beyond the eastern point the shore line bends in the direction N18°W as far as a heavily wooded islet shaped like a cone. In the stretch [about one nautical mile, according to *Le Génie's* chart—ED.] between the eastern point and the wooded islet you see, all along the shore, rocks and little islets that—and so the wooded islet too—are close to the mainland.

Let us go now into the bay at the NE, which I have named after St. Cecilia. It is not very large; its bottom is first-rate; the sea is calm and you lie completely sheltered from the prevailing winds. At the back is a small sand beach, easy to land on; near at hand is a beautiful rivulet, but you would have to bring casks ashore—no, no, at the left there is a fall, from which you may get water by a hose reaching to your launch. To the right again, beyond the rivulet, there is no water; the northern point of the island is plenty high, but too narrow to furnish any. But at its tip, beyond a channel not very wide though pretty deep, we discover

the largest, highest, and most northerly of the islets. Sheltering *Le Génie* from seas from the west, it shall henceforth bear her name.

From our anchorage it was a half mile to the wooded islet, S59°E; and .72 m. to Génie Islet, N51°W. The two islets lie 1.19 m. apart, N44°W and S44°E. Off .35 m. S48°E, well within the bay, was another small islet, or rather a rock. Finally, the distance to the rivulet was .47 m. S30°W.

I have spoken of the northern point as being very narrow. This means that across it you come upon another bay, facing NW, in the center of which there is a large islet that leaves not room enough to anchor in. But, at 1.37 m. S46°W from Génie Islet—which is almost hidden by the islet we have just been rowing past—there is a high point, standing straight up, that gives us a glimpse of the sea beyond through an opening shaped like a Gothic arch. This natural tunnel is not large enough to let us put our small boat through, so we double the point.

The shore turns in on itself, runs a little way eastward, and comes out again only after it has formed a bay bigger and more picturesque than St. Cecilia Bay. Inshore there is a lack of water; offshore, deep water, a rough bottom, and the sea itself less quiet. Still, you can anchor; and a little shanty and some small-boat scraps show that a whaler has come in to repair her boats. At low tide, landing is very difficult; at high tide you can come up into a stream—it is almost a river—that you shall find at the southern edge of a sand beach, and at the foot of a hillock standing at the center of the back shore of the bay. The opposite side of the hillock there is another stream, beyond which the shore line swerves westward, forming, as it rounds out, a point marked by cascading water. Here it turns S68°W to bring up at the western extremity from which I had started and which, because of recognizable characteristics, I shall call Thumb Point. It is 2.53 m. from the point distinguished—as said above—by having been bored through by natural agencies.

One finds this segment, also, of the island's coast line belted with islets. One is close to the bored point, off the entrance to the bay of the river; another, smaller, is deep inside. The islet farthest out—marked by naked broken rock—is about half a mile offshore [one mile W of islet off the bored point—Ed.].

To sum up, the coast line of Cocos Island is clear and sheer, the islets carry no danger. The only rock worth notice is the one I came so close to, off the island a mile SW; yet this rock is not to be feared, for the slightest turn of the helm would be enough to miss it. I dare say—in short I may affirm—there is no hidden peril, seeing that when I sailed round the island the sea was rough enough to break anywhere it would have been too shoal for passage.

Let me now draw you away from these dry but inescapable particulars to the great hewn and torn cliffs that make the flanks, all around, of Cocos Island. Ordinarily, such a sight would no way be very attractive; here, on the contrary, the spectacle is the most beautiful, the most picturesque, you could conceive. Here you find assembled in reality all the marvels that imitative man strives to recreate in the parks and gardens of kings. Where the ground edging the sea is too flinty to sustain such giant trees as cover the heights, there climbers of the pea tribe, of the morning-glory clan, seize on stray trees, entwining and choking them, reaching out from one to another till successions of bosky columns, walls, and vaults are built, from under which you shall now see winding rills and now cataracts foaming noisily down headlong hundreds of yards. And as if this land must be privileged in all respects, her exquisite cincture—whose bluish green contrasts with the cooler and softer green of the forest—dips its outermost twigs in salt water to confirm Vancouver's just observation that here the sea is never possessed with wrath and the winds revere the enchanted isle.

But to know whether the outer aspect of the isle is not deceitful, you must submit to mounting with me the difficult scarp that rises from the head of St. Cecilia Bay—unless, to spare yourself the labor, you would rather pay a few minutes heed to the log of my own excursion.

With me were officers not duty-bound on shipboard, and sailors armed with axes and hatchets. The rain that had let up a bit before we came off, set in again, harder; but, the ship forsaken, it was not for us to turn back before we had outdone as penetrators those who had come before us. So we landed at the rivulet, by now a torrent, and followed up it a little way; then, breathing in a good stock of air, we tore through the scrub without a thought for troubles left behind. Sharp rock—slippery footing—out-thrust branches—bindweed—nothing could stop us. The ax cut through one impediment, the hand shared in scrambling over the other; and so, panting, streaming with sweat, we

A hundred years after Le Génie, Cocos is still jungle. Members of the Oaxaca's scientific party pause in a clump of coco palms. (Photograph courtesy Captain Allan Hancock)

made the top. There we took breath. Nothing stood in the way of advance. The ground, though covered by full-grown forest trees, is open and clear except for a sedge with keen-edged leaves, besides some shrubs and a great variety of ferns. Some of these ferns, arborescent, are of such girth and height as to let them blend with the true trees, many of which support gigantic lianas. Overhead we were sheltered by a lofty verdant vaulting that by cutting off the sun's rays refused general license to ground herbage and climbers. To each its own realm, to reign in as despot.

Able from now on to move freely, we followed the ridge that for some time gave us fairly good level going—confining us, however, because to right and left were precipices. All the same, I had blazes cut on almost every tree.

The first trees we met reach only a short way into the interior. They are tall, straight, and up to a great height branchless; their wood is very white and soft (sp. gr. 0.165); a thick pith is at the heart; the fiber is fairly strong and will stand torsion, but the wood is not close enough of grain to have utility. Trees we saw later are much less easy to cut into. Three species look to me suitable for construction purposes. One of these, with a leaf much like the laurel, grows to great dimensions. Its red wood is very hard and dense, perhaps rather brittle (sp. gr. 1.065); it is a chestnut. The seed of another is quite like an acorn, turning, when ripe, a violet brown. The wood of this tree—reddish in the heart—is good and hard (sp. gr. 0.570), but

size is lacking. The third tree—small-leaved—furnishes a wood finer, denser, and harder than the walnut that it resembles (sp. gr. 1.057). Unfortunately this tree, so far as I saw it, does not attain the size of the chestnut.

No doubt you wonder that I have not spoken again of coco-nuts in this island named for them. The reason is that up to this moment we have found only blossoms on the few trees encountered. But now that we have got into a defile where the palms are more numerous, we shall perhaps be able at last to gorge on nuts to the heart's content; for you cannot think we would not have looked for them. Ah labor in vain!—there are none, not a single one, young or old; only a scrap of broken nut to tell there have been some.

Having got down into the defile, we tried to follow its stream-bed. On one side then the other, we were stopped by high rock walls. Everywhere about us and in the distance it was mountain, ravine, canyon. Nowhere did we come upon a flat of any extent.

All over the excellent fertile soil, great trees; but the slopes are too steep for plow or even for spade.

Meanwhile the rain kept on, and we—the fact is—were so wet we had quit thinking about it; still, the day was wearing on and we had to take up the trail back. Thanks to the great care with which I had marked it on the way in, we retraced our steps without much trouble. It happened several times that we had to stop and consider, but only until the shout *"Coche!"* ["Blaze!"—ED.] of our scouts told us we were all right.

So far, then, everything was going well, and not the least worried about safety we were poking and prying about most heedfully to round out our investigations into places and things. All at once a new conditioning circumstance seized hold of us: here we were back at the rim of the cliff we had surmounted with so much toil, and now, in a kind of terror, our eyes appraised the precipitous descent that in our morning climb we had hardly noticed. What to do? Go down we must. We made it, too, and luckily without mishap; but not without being again and again brought by our bottoms to the slick clayey ground, which we would hold to by putting trust in a branch, in a liana, or sometimes even in a fistful of grass. Soaked to the bones, covered with mud, we found ourselves at last at the bank of the brook. We tumbled into the warm water of one of its many pools, till—clean and rested—we forgot pain and ache and went back on board fully minded to have another try on the morrow from another point.

We had it; but so as not to abuse your kindness I shall tell you only that in our later excursions we found everywhere much the same terrain. The surgeon reports coming upon a pig that looked rather wild to him, and other recent and unmistakable swine tracks have been found. No goats, no brown and white rats, no blackbirds, no teal or other ducks have been seen—creatures Vancouver says he saw. Sharks are no longer so numerous as Vancouver says, nor so huge nor so ravenous. It strikes me that land-birds are as scarce as sea-birds are common; almost all the trees along the shore are burdened with the nests of the red-throated frigate-bird. Fish are plentiful and good; most notable as well as most formidable is the enormous species of ray called Mantor.

In resumé, Cocos Island makes a choice place to put in to. At this time of year St. Cecilia Bay is a first-rate anchoring-ground; if, though, during a given period the prevailing winds are NE, the bay of the river should be preferred—but then only. I am unable to mark off the island's seasons. Everything, however, leads me to believe it rains often and much; for otherwise an island so small could not feed so many streams and waterfalls.

Throughout my stay the thermometer has stood at 25°C., the heat being neither oppressive nor sultry. Sharing Vancouver's opinion of the climate, I consider it very healthful.

The island comprises several ridges, the top lines of which—lying in general in a horizontal plane—are broken by few notches or dips. Its soil surface is extremely uneven; in spite of the island's fertility, I doubt whether—what with so steep slopes everywhere—there is a single piece of arable ground. On the other hand, if people should settle there as colonists they would certainly find ways to grow fruits and vegetables for no matter how many.

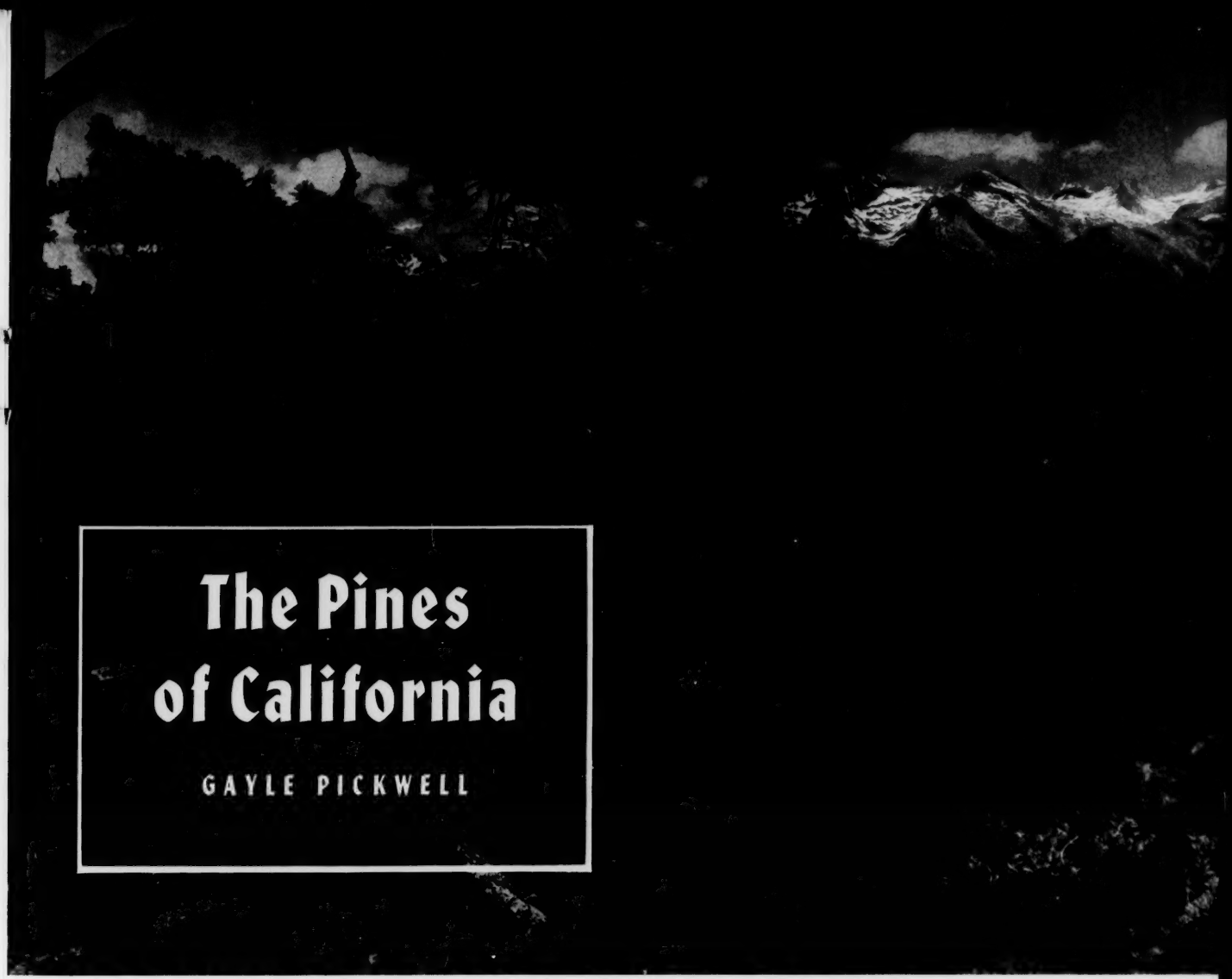
Finally, the woods are full of merchantable timber of good sizes. Forage, though, is scarce enough to justify the belief that it would be difficult to keep flocks or herds here. Such, in substance, is the opinion I have formed from what I have been able to see.

I am with regard, Admiral,

Your most humble and devoted servant

Captain of Corvette, Commander the Brig
Le Génie

(Signed) CTE DE GUEYDON



The Pines of California

GAYLE PICKWELL

A sugar pine's long, graceful branches and pendant cones against their most characteristic background, California's Sierra Nevada.

Photographs by the Author

WHERE ROCKY HILLS and ridges are dry and hot, whether they be in the inner coast ranges or along the length of the lower west slope of the Sierra Nevada, there is a gaunt, leaning tree that seems to have chosen for its own a tree home that most others shun. Its long needles are hung so sparsely that their pale bluish color seems to blend into the haze of the distant hills that show behind them. Its crown is usually divided, the center trunk splitting to send up two (at times more) limbs instead of the single mast of most conifers. This, the Digger pine (*Pinus sabiniana*), surmounts the ridges that rim the Sacramento–San Joaquin Valley, and though in the Tehachapi Mountains at the south it may climb to 4,000 feet, it occurs for the most part between 200 and 2,000 feet. In its lower reaches it associates with the blue oak, and at its upper limit its thin crown gives way to the heavy majesty of the yellow pine. Only through the Santa Lucias does it break out of its inland confines to reach the coast.

The Digger pine, so unimposing, so seemingly worn and frayed by the winds and paled by the sun, produces in great numbers enormous cones,

Digger pines of Sierra foothills and inner Coast Ranges.

Trunk of yellow pine with shield-like plates.

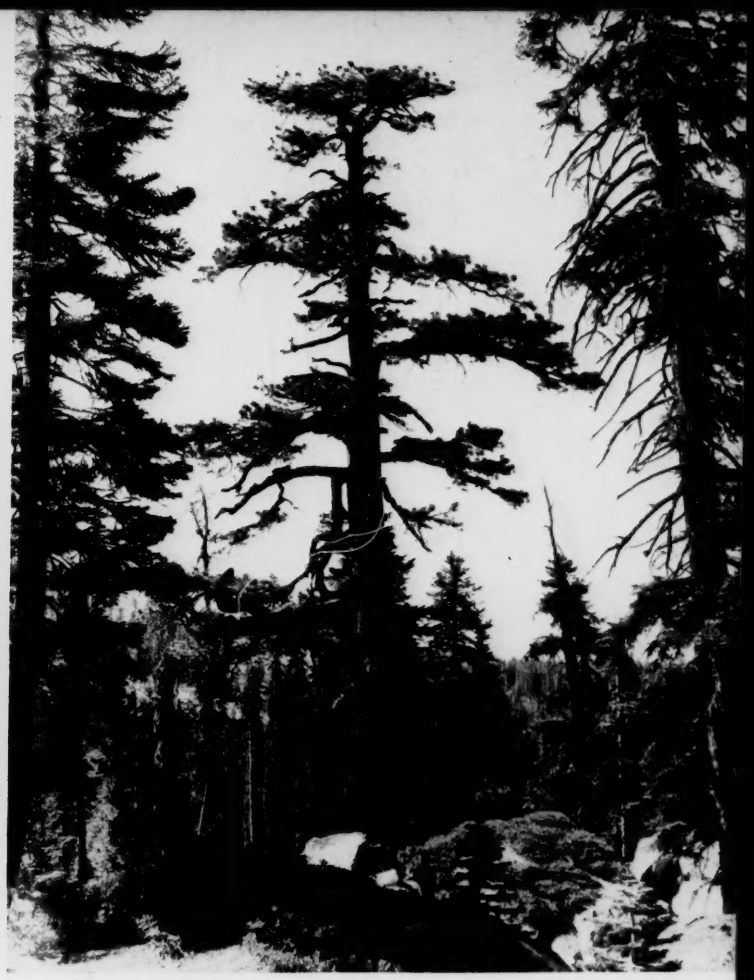
Ro

heavy, hooked, and filled with "nuts." California Indians — "Diggers" because the earth provided their living, not the chase—stocked their larders with these cones, eating them green and eating their "nuts." Small wonder these earlier Californians looked on in anger and alarm when the destructive white man, seeing nothing but fuel in this pine, ruthlessly destroyed it. The Indians have gone but the pines live, carrying the name of the people for whom they provided food, still shaking out their long thin foliage like a part of the blue haze of the rolling hills.

At the upper fringe of the Digger pines in a region of 2,000 feet elevation, the yellow pine (*Pinus ponderosa*)—frequently called ponderosa pine—shows its trim form. For the most part the yellow pine cannot be mistaken. It is dark green, the Digger blue-green; it is tapering of stem and orderly, the Digger disheveled; it has dense foliage and that of the Digger is loose and thin. The first dark pines of a climb up the Sierra Nevada from the Central Valley will be ponderosa. Though they first appear at 2,000 feet, more or less, in central California, they are scattered trees there, and small when compared to the impressive giants of higher elevations—towering fellows that grow to 150 or even 200 feet in height in the three and a half to five centuries they live.

The bark on the trunks of these massive trees is in shield-like plates, reddish buff in color. The wood itself tends toward a yellow and is one of the prizes of lumbermen, who encourage the name ponderosa to distinguish it commercially from the inferior yellow pine lumber of the southeastern states. The full name of ponderosa is, indeed, western yellow pine; it occurs extensively throughout the west, reaching northward to British Columbia. Although it achieves its greatest size on the

Road through Monterey pines, Monterey Peninsula.



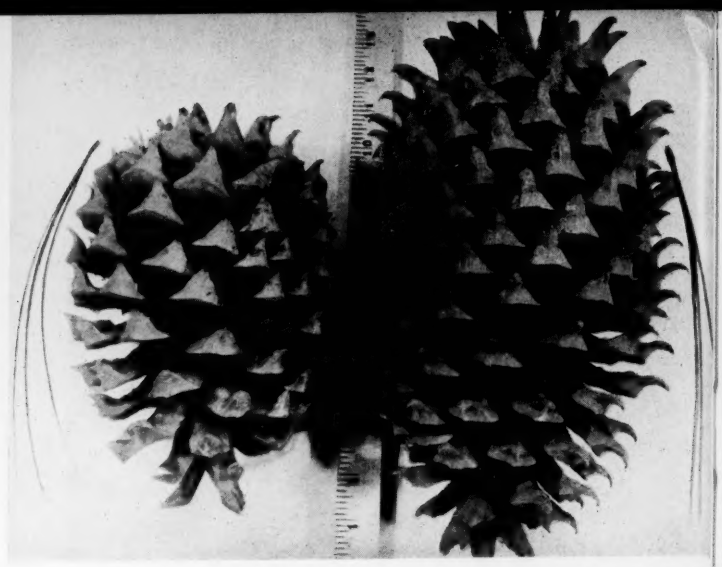
A grizzled old silver pine of the Sierra.

Pacific slope, its largest single "pure" stand is that of the Kaibab National Forest in northern Arizona.

The Digger pine forms a loose ring about the big Central Valley of California not less than 500 miles long. The Monterey pine (*Pinus radiata*) is found in patches in a narrow strip extending not over 130 miles along the Pacific, from Pescadero to San Simeon Bay; and far to the south, in the ocean off Baja California, it holds a lonely outpost on Guadalupe Island. The Digger pine lives where sun nearly always shines and strong winds blow; the Monterey pine thrives in ocean fogs. Past history has been unkind to this pine, for once, fossils show, it ranged more widely on the coast and might have spread farther inland—but climate changed during the ages; the inner coast ranges arose to block, with their lessened rainfall and heavy winds, and thwart the eastward migration of the tree. So, running to the very spray-line where sea winds distort it, bow and bend it, and cover its gnarled carcass with sand from the dunes, the Monterey pine is held in its narrow home. Because of this, it has been said to form a "tree island."

New cones of the Monterey pine are closed and firm; they do not open for several years and frequently not until the heat of fire sweeps through the forest to loosen them. Even after their seeds have been shaken out, the old cones stay on the limb until the branch tip, where new cones are produced, is many years and many feet beyond them.

On Monterey Peninsula stand the chief forests of native Monterey pine. Here the virgin loveliness of the tree may be seen in its ancient home. So lovely a tree indeed and so adaptable is it to cultivation under a variety of conditions, that man has picked it up, and has carried it over Cali-

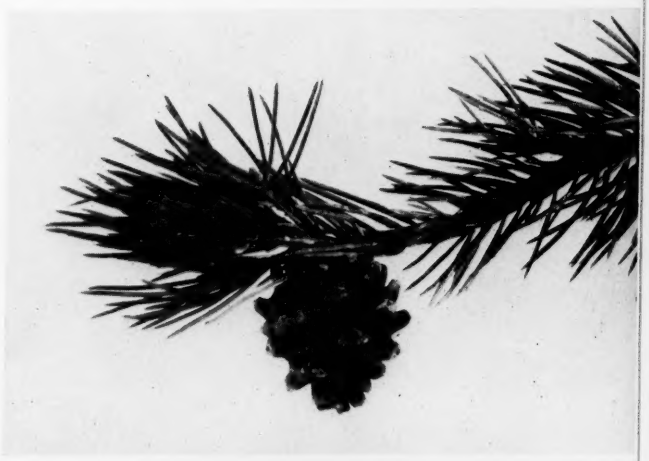


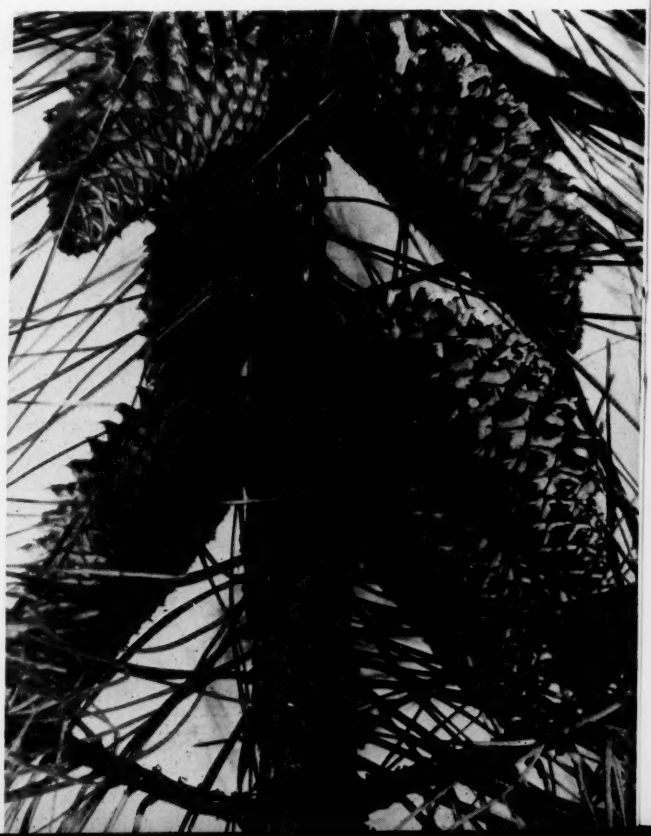
fornia, over the world, to plant and to nurse it. Thus the Monterey pine, held back by nature with an ocean on the west and dry hills to the east, has nevertheless through man been allowed to display its beauty over much of the earth.

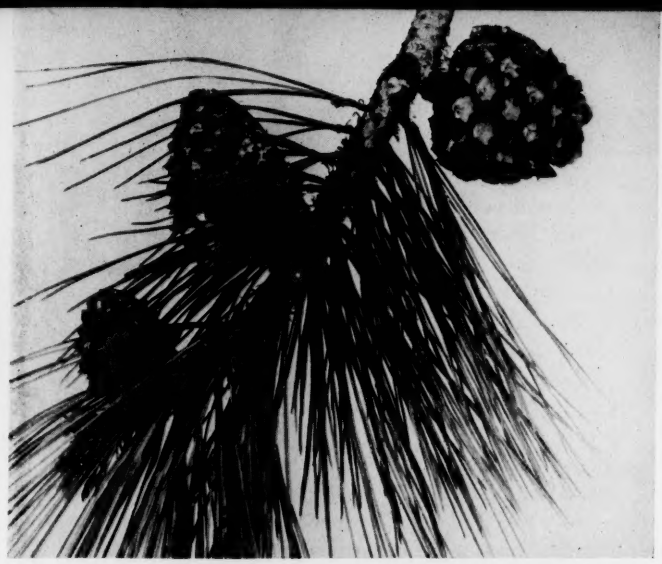
Similar in appearance to the Monterey pine is the Bishop pine *(Pinus muricata)*, which extends along the coast where conditions are favorable from Trinidad in Humboldt County south to San Luis Obispo County, with outliers in the Channel Islands and in Baja California.

Like the Monterey pine and certain cypresses, the Torrey pine (*Pinus torreyana*) is an "island tree." It occurs only in scraggly-topped stands, limited to the coastal region north of San Diego at Del Mar, and on Santa Rosa Island. Changes in temperature and moisture have isolated the Torrey pine to these small "islands," many sea-miles apart. It is a short, flat-topped tree.

Those who climb the Sierra and explore the coast and desert ranges know a few mountain-growing species of restricted habitat. They are the limber pine *(Pinus flexilis)*, ranging from the Mt. Piños region on the east side of the Sierra Nevada eastward to the Rockies; the hickory pine *(P. aristata)* of the high desert ranges north of the Mohave Desert; the Parry piñon *(P. cembroides* var. *parryana)* in the San Jacinto and Santa Rosa Mountains; the one-leaf piñon *(P. cembroides* var. *monophylla)*, growing on the eastern slope of the Sierra (occasionally on the west side), and ranging across the plateau country to the southern Rockies. The piñons of the arid uplands and mesa lands supplied the "pine-nuts" so valuable as food to many Southwestern Indian tribes.







Needles and Cones of Some California Pines

TOP ROW—LEFT TO RIGHT: *Cones and leaves of lodgepole pine. Cone and needles of Digger pine (to left of inch scale) and of big-cone pine. Cones and leaves of Torrey pine.*

MIDDLE ROW—LEFT TO RIGHT: *Cone and needles of one-leaf piñon. Cones and leaves of Bishop pine. Cones of the beach pine.*

BOTTOM ROW—LEFT TO RIGHT: *Cones and leaves of the knob-cone pine. Cones and needles of the Monterey pine. Cones and leaves of the silver pine.*

The big-cone pine *(Pinus coulteri)*, so named because of its unusually large and massively heavy cone—largest of all pine cones, grows in the Mt. Hamilton Range and other coast ranges to southern California.

The knob-cone pine *(Pinus tuberculata)* reseeds itself in the ashes of the parent trees. This behavior of the "fire-type" pines is one of the most remarkable of tree adaptations. And the knob-cone is the most remarkable of an extraordinary group, for unless the heat of a fire opens the cones, they will remain closed for 15 to 25 years. The persistent cones cling for so long a period that the tree becomes heavily burdened with them.

This pine grows here and there on rocky ridges from the Santa Lucia Mountains north to the Siskiyou Mountains and southern Oregon. It also grows in the Sierra Nevada from Siskiyou County south to Mariposa County, but nowhere is it abundant. It is a shrubby pine, one of the shortest of all. Its crown is frequently divided into a forking tip, thus faintly resembling the Digger pine; but the knob-cone's foliage is denser and its needles are three to five inches long and upright, in contrast to the very long, drooping needles of the Digger.

Sugar pine *(Pinus lambertiana)*, the most beautiful of all pines, impresses one with a charm and grace that leave an entrancing memory. This tree grows best between 4,000 and 6,000 feet in the Sierra Nevada and the coast ranges, but in Oregon grows at lower elevations.

The longest of all pine cones dangle from the tips of sugar pine limbs. It is largely because of the weight of these cones and their placement at the very tips of the limbs that the branches droop. The cones, a foot or more long, hanging from the very branch tips, are a certain identification of this appealing tree. He who investigates closely will find five needles in a bundle.

A closely related tree, the silver pine *(Pinus monticola)*, occurs here and there at elevations of about 8,000 feet. Its needles are the same length and its cones, though much shorter than those of the sugar pine, are very similar in appearance. Because of its cones the silver pine is sometimes called the "little sugar pine"; it is also called "western white pine" and "mountain pine."

The Jeffrey pine *(Pinus ponderosa* var. *jeffreyi)* is common on nearly all the high mountains of California, but since it seems to grade almost insensibly from the yellow pine, one may have Jeffreys all about without realizing that here is a different tree. The bark, however, even on large trees, will not have the large shield plates of the yellow pine, but will be cut into small, irregular blocks. Though its needles are very similar to those of the yellow pine, its cones are fully twice as large at their maximum. Yellow pine cones are three to five inches long; those of the Jeffrey six to eight.

The tamrac or lodgepole pine *(Pinus contorta* var. *murrayana)* begins, sparingly, at 4,000 feet; and the last are not seen until 10,000 feet or more elevation is reached. They are at their best, however, at 9,000 feet, where they form the last of the true forests. Their needles are so short that the tree looks at a distance like a fir. The cones are quite small with curved, sharp hooks. One need never mistake these trees for their bark is thin and always scaling off in flakes. No other tree in the high mountains presents this appearance.

Both needles and cones of the tamrac or lodgepole pine are the shortest and smallest of all the Sierran pines. There are needle-sharp spurs on each of the bracts and two needles in a bundle.

The lodgepole pine is a variety of *Pinus contorta*, the beach pine, which lives along the coast from Mendocino County to Del Norte County and north to Alaska.

At 10,000 feet elevation, where snow always lingers, may be found the foxtail pine *(Pinus balfouriana)* and the white-bark pine *(P. albicaulis)*—last of all the trees. The foxtail pine grows from 6,000 to 11,500 feet elevation high in the Sierra Nevada and also in the far north coast ranges. The white-bark pine has been restricted to the last home of trees, the tree line of high mountains, near the region of perpetual snow. Here it is buffeted by high winds, forced prostrate by the snows, held to dwarf form by weather that is rarely warm. It is the index that the mountains are high, that forests have ceased, that the tree line is at hand. Short needles, short cones, and a rubbery stem are equipment with which the white-bark pine resists a constant wind; and its stems are so tough that the mountaineers call it the "rubber pine."

IN THE IDENTIFICATION of a tree, it is important first to note the locality and life zone or ecological environment where the tree occurs. In the pines another aid to identification is the number of

needles in a bundle. The pines of California are listed below according to the usual number of needles in a bundle:

One needle – one-leaf piñon; two needles – Bishop pine, beach pine, tamrac or lodgepole pine; three needles–Digger pine, big-cone pine, knob-cone pine, Monterey pine, yellow pine, Jeffrey pine; four needles–Parry piñon; five needles–hickory pine, Torrey pine, limber pine, sugar pine, silver pine, foxtail pine, white-bark pine.

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Torrey pines in the Torrey Pines State Park at the edge of the Pacific, near San Diego, California.

Trails out of Tripoli

BORYS MALKIN

Sousse, Tunisia. October 10, 1948

DEAR DON:

London and the physical and mental fog of the days of getting myself and my gear collected and shipped off for a year or more in Africa are now happily far behind. Napoli was the start of Mediterranean—and African—roads.

Four days in that wretched port were too many, but I found the Stazione Zoologica, one of the world's best known marine biology stations, an interesting place to wait ship. The station's war scars are healing slowly, and although it is still impoverished, foreign visitors are filling its laboratories as they did in pre-war days. I took a trip to Sorrento, only to realize how overrated the locality is. It is an attractive enough spot, but to me New Guinea's Milne Bay as well as many a cove on the Oregon coast or even certain Scottish lochs far surpass Sorrento. On the other hand, a trip to Pompeii came up to expectations, and here I realized far better than anywhere else the picture of a vanished way of life. Finally, at noon, August 21, the Italian motor ship *Cellio* lifted her anchor.

Tripoli. Gate to the Arab City. (Photographs by the author)

Soon we passed Capri and I settled down to enjoy the leisurely, calm passage to Tripoli and the rest I badly needed after hectic traveling across the Continent through Paris, Geneva, Milano, and Firenze. There was only one worry to prey on my mind: a considerable list the 2,600-ton vessel developed. But it was only a wound-stripe the *Cellio* acquired after much time under water (by way of bombing). She was lifted, righted, and pressed into service with this condition, permanent—which, I was told, meant it wasn't dangerous! We stopped in Sicily and Malta. Both islands struck me by their pallid colors. Apparently advanced summer in these parts is even more arid than in California. In fact, the Maltese had to import several thousand tons of water this year from Italy.

After Malta the sea became quieter than ever and the flying fish appeared—sign of warmer temperatures. About noon, August 24, the *Cellio* stood into the wreckage-littered port of Tripoli—and, for the first time, I was in Africa.

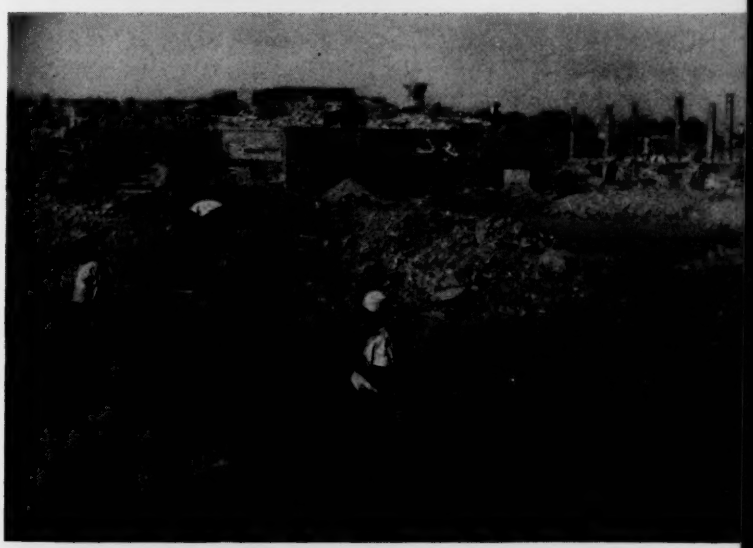
Tripoli brought mixed feelings. At first I vainly looked for signs of Africa, other than the blazing glare and the whiteness of the city. The houses along main streets looked no different from those in Milano with their "moderne" architecture—but soon, after repeated trips, I realized that here was a different world.

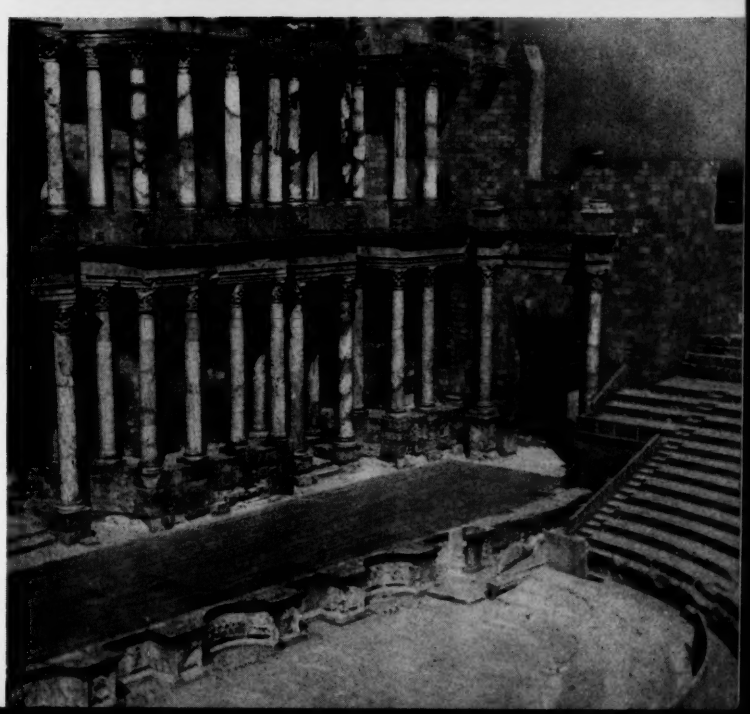
Having undertaken to dig my way into Africa, I went on to Sabrata to rejoin my archaeological party from the University of London. During the first four weeks in Tripolitania my time had to be occupied more or less exclusively with the Sabrata excavations —which much cooled off my enthusiasm for this sort of entertainment! It is hard work, the more so when the material well-being of the personnel cannot be attended to as well as one would desire. There was shortage of fresh water (nobody's fault, just the sort of country); there were Italian cooks who loved spaghetti, which meant all too much of this serpentine grub; there were uncounted swarms of flies, which are always present wherever the Arabs are; and finally there were the eternal heat and the long working hours. But, for all these things, I don't regret a moment of the time. While on the diggings, I had to shelve entomological business, and only an occasional hour during the evenings or week ends could I spend afield, with unspectacular luck.

I am not sure what momentous results, if any, our expedition achieved, but at any rate it did a far better job than had our Italian predecessors. The Italians did splendid conservation work, but the strictly scientific archaeology suffered because they seem to have spent most of their energy and emphasis on resurrecting the ghost of defunct empire and linking it with the present—to the glory of Mussolini and *fascismo*. Stratigraphy was much neglected. Our leaders, on the other hand, directed the work with admirable attention to detail. Every little item, no matter how relatively insignificant, was noted, described, marked with respect to its stratigraphic sequence, dated, and finally packed away. With altogether about thirty people working here in the course of three months, you may guess the amount of material accumulated for later analysis.

One thing is certain: we extended the existing knowledge of the earliest Phoenician Sabratha (note I am using this time the supposedly original Semitic spelling). I was fortunate enough to have been given a trench to dig which exposed part of the Phoenician wall of the city. As my Arab workers dug deeper the characteristic Phoenician (Punic) potsherds of yellowish and greenish pastel color appeared and soon became the exclusive type. There too, occasionally, the Hellenic imported ware with its characteristic black glaze intruded, indicating pre-Roman strata. What we actually dealt with for the most part had been the most ordinary refuse dumps where the housewife discarded useless objects, to be collected with great reverence by the archaeologist some 2,000 or 2,500 years later. But from these one learns a great deal about the everyday life of this ancient people. Their household utensils, their style of dressing (example, an ivory hairpin), even their way of dealing with sanitation (a drain, for example)—all could be pieced together from inconspicuous fragments. There were coins, which had to be cleaned in a chemical solution for deciphering. The city's diet was revealed, in part, by pig jaws, camel teeth and bone splinters, *Murex* and *Pecten* shells, and bird bones. We had here an unbroken sequence of human occupation over a period of nearly 1,200 years.

Sabratha, like Oea (modern Tripoli) and Leptis Magna—three cities (hence Tripoli and Tripolitania) close together on the coast, with Sabratha to the west and Leptis to the east—owed its existence to the Phoenician traders from Carthage who founded it some time in the ninth century before our era. We dug back to approximately the fourth century B.C. The Romans came about the first century A.D. and after them the Byzantines. Finally the Arab invaders of the seventh century dealt the death blow to this colony. The fate of Sabratha is clearly illuminated—the small Semitic (Phoenician) outpost, the rapidly expanded Roman city with its villas in the suburbs whose remains can still be uncovered in the vicinity of the site, beyond the main area, and, toward the end, the shrinking Byzantine settlement shown by the walls encompassing a far smaller city. Similar was the fate of Leptis Magna; but Leptis came to greater splendor than Sabratha. At her peak she is said to have numbered 80,000 inhabitants, which is a great deal for an ancient city. Her best days were those of the emperor Septimus Severus and of his successor Caracalla. Septimus Severus was born here and did a fine job of beautifying the city. The new forum, the basilica, and the great baths, of which he erected the first two, are as impressive structures as one sees anywhere. Here the Oriental influences on the late Roman empire (this was the end of the second and the beginning of the third century A.D.) are very obvious, particularly in ornamentation and in the heavy, sloping doorways





ABOVE: *Ruins of ancient Sabratha, looking toward the Mediterranean Sea, Tripolitania.*

MIDDLE: *The author's party and Arab workers excavate a portion of Sabratha.*

BELOW: *Stage of the Roman amphitheater at Leptis Magna exemplifies the grandeur of this ancient Roman city in North Africa.*

ındirectly derived from Egypt. Sabratha was more Hellenic, the new Leptis more massive, efflorescent, Oriental.

In contrast to bone dry (modern) Sabrata, Leptis still maintains much vegetation, as she did in the Roman days of brilliance. There is water yet in the Wadi Lebda in the mouth of which the Romans built a magnificent port. Abandoned, the port filled in with silt and sand. Now a wide split separates the freshwater stream from the sea where once ships entered. To this *wadi* I went whenever visiting Leptis Magna, in order to collect insects. The animal life here is far richer than in Sabrata. More insects and especially more birds have found hideouts and breeding grounds in the dense vegetation surrounding the now brackish stream. Here I found tiger beetles and, higher up in the dense hills by turning over stones, other beetles and hosts of scorpions (always just one under each stone). The Tenebrionids, as usual in desert regions, dominated the insect world. I think at least half of all species I have seen hereabouts belong to this beetle family, with the genera *Akis, Pimelia,* and *Blaps* each represented by several species. A species of *Timarcha,* a Chrysomelid beetle, congregated in large numbers under some of the stones. All these and others would frequently group together in this way—something I have long wondered at. In my years of field work, much of it in arid and semi-arid areas, I have often found these congregations of insects under certain stones but not under others. Why? Was it the position of the stone with reference to the sun which, combined with its mineralogical structure regulated the temperature and rate of cooling and warming, to influence the animals in their search for a daytime shelter?

DERVISH CEREMONY is something we read about but never expect to see, even if we get as far as Arab country. Some Arabs are reluctant to entertain "infidel" visitors, and colonial officials are reluctant to risk the trouble in which the visitors may become involved. But while in Sabrata eight of us had the rare luck to see one such festivity, which members of the Sawiwa sect performed for the glory of its founder, one *marabout* called Ibn Isa, of some few centuries ago.

Two of our Arab workers were our hosts. The eight of us walked with them across the desert to an oasis some three miles distant. The sun blazed as usual, and crossing this desolate country I was as acutely aware of thirst as I had been once when walking in the Sonoran desert near Guaymas. I took no water and was genuinely relieved when we reached the oasis. Just before we reached it the Arabs motioned us to split into two groups; they dared not entertain eight together. We came to a large lemon tree and sat under it. Here the ground had been swept clean; colorful rugs covered it as well as the wooden boxes and

ABOVE: *An Arab sheik of Tripolitania.*

MIDDLE: *Derv'sh dance. Two exhausted boy dancers have just dropped out of the circle and, squatting, are about to pass into a coma.*

BELOW: *The court of a troglodyte dwelling, near Garian, Tripolitania.*

empty water cans on which we sat. Sal-a, one of the Arabs, acted as host, with his younger brother joining to help. Soon a thick Arab tea was brought, and after that the *cus-cus* made of millet, meat, potatoes, and boiled eggs. After the meat, a wonderful watermelon. All this took place slowly with grave though simple ceremony. If the Arabs on other occasions were annoying with their forever asking for *baksheesh*, here they were perfect hosts. A guest in their home was still a person of great importance.

After nearly three hours under the tree, when the heat of the day was slowly passing away we moved out to see the ceremony of the Dervish dance. About 3 P.M. noisy music, beating of drums, and wailing of women signified the approaching procession. The Arabs selected a spot for us near the circle where the main dance would take place yet sufficiently far to ensure our safety. Apparently it preyed on their minds that one of us might get hurt when the performers got out of hand. The long procession wound into the circle. There was a constant beating of the drums.

At first it was difficult to distinguish anything, but soon we could see the individual performers. They were of different ages and apparently of different standing. The youngest boy seemed not over fourteen. Some men were bedraggled Arabs; some were stately, handsome men, of apparent distinction. All performed in a frenzy. Unfortunately, it would not have been wise for me to venture close enough to see clearly or photograph their facial expressions. There was no step to the dance, one hour after another. Frequently men would embrace and kiss one another, or at times they would try circus acrobatics, jumping over each other. They all shook their heads from side to side to the beat, seemingly in utter helplessness. Occasionally one would suddenly grab a knife at his side and deliberately thrust it through his cheek or his side near the abdomen. Now and then a man would collect ground glass from a guard and swallow it, or, shrieking wildly, would run through the circle toward a growing *Opuntia* hedge and barehanded tear the cactus away from its base and pressing it toward his breast bring it back to the circle and proceed to swallow the spines.

The peak of the performance came when a Negro climbed to the top of a date palm high above the circle, undressed to his shorts, and then hung down, still trying to move to the beat of the drum. I was sure he would drop in a moment and kill himself. But his feet gripped the tree and he eventually returned to earth unharmed. The dance was exhausting; one by one the performers dropped and passed into a coma. The guards would drag them toward one side of the circle, fold their arms in a peculiar manner, and keep them in that condition until they recovered. Then they were led away beyond the circle, their performance finished.

And what of all this? Obviously to us it was a performance controlled for the most part by one or another sheik sitting under a green tent. The men did much as the sheik directed. Even their most frenzied acts bore witness to knowledge of what they were doing, at least to some extent. The Negro who climbed the tree plainly took great care to the fastenings on his legs, in the very same manner as when he climbs for dates. The stabs and knifings are also deliberately and obviously in spots pre-selected, presumably stabbed many times before. I noticed no bleeding at all. Yet within these limits the performance is genuine and I don't doubt that cases occur when *marabouts* seriously hurt themselves giving vent to an unexpected burst of energy unforseen by the man controlling the performance. What struck me most was the attitude of the onlookers. Some no doubt thought this a grave religious ceremony, but most of the Arabs—particularly the boys but many of the elders too—seemed to regard all this in very much the same light as we would a circus performance. It was simply a good show to them.

It seems here we have a state akin to the hypnotic, which can be induced in a certain type of person. There is no doubt some of the self-induced hypnotism which is associated with contemporary Asiatic shamanism, and which was found in the past with various sects of the early Christian church. The Arabs still regard a person capable of such feats with a degree of veneration, only certain individuals qualifying. Much research remains to be done before a clear answer can be given. Anthropologists and psychologists disagree among themselves, but Kardner, Linton, and Benedict have made useful suggestions, as have others.

A VERY DIFFERENT COUNTRY from the coastal plain where Sabrata, Tripoli, and Leptis Magna are situated is the upland plateau to the south, a part of the Libyan Desert. There I went late in September when the archaeological work came to an end, going by bus to Garian, a small settlement on the edge of the Gebel escarpment where the plateau drops away suddenly to the coastal plain, and traversing the Gebel westward to Nalut, a Berber town within a few miles of the Tunisian border. On the plateau, elevation roughly 2,500 feet, different conditions prevail. It is still a "predesert" area, but with characteristics quite comparable to our own best arid sections in Arizona. What the naturalists of North Africa call genuine desert is probably bare sand dune or bare rock without any growth at all. To me, however, it was all real desert. Just to make sure it would seem that way to me the *Ghibli* (Arab name for the hot wind from the desert) blew in a few days before my arrival, covering with dust much of the vegetation, shifting sand dunes, and generally making life miserable for all concerned. *Ghibli* also comes to the coastal plain and the Arabs there know it only too well. They much prefer the *Bachri*, a wet wind from the sea.

Garian offered little in the way of insect life, and the dearth was not relieved at all as I went farther west in the upland region. I found a few Tenebrionid beetles—*Sepidium, Pimelia gibba*—I'd not found in the lowlands (no proof they didn't occur there, my stays being too short everywhere for thorough collecting); but if there was anything notable about the higher land it was the scarcity of life even by comparison with the none too rich Sabrata area. Nevertheless, from the human standpoint the area is no less interesting, though less spectacular. For here most of the people (Arabs as well as Jews) live as they did centuries ago—the troglodyte way. Their homes were great dugouts, with deep, even-faced walls, usually square. The main dugout forms a yard from which tunnels and chambers are bored. There is usually only one entrance leading into the yard from the outer surface and this connects with it through a long channel. One may call these underground dwellings primitive if he likes, but they certainly solve the problem of temperature in this land of cool nights—it frequently snows in Garian during winters—and extremely hot days, far better than anything we have devised. Each family has its own entrance way and square. Some of these troglodytic dwellings are said to date back to the middle ages.

Going back still farther into time, I walked one afternoon with the local schoolteacher who is something of a naturalist to a field where he has found neolithic relics. At least, the crude scrapers, chisels, blades, and other artifacts we picked up are said to be of the Neolithic age, but so rough were they, they looked more like paleoliths to me; but Dr. Chiesa, the geologist in charge of the Museo Libico in Tripoli, says they probably belong to the era immediately preceding the Roman. Many of the pieces I found show signs of wear but I do not think this is proof of early usage; it could be secondary usage, because the Romans in the past took to flint to light fires, as the Arabs do even today. As for paleolithic sites, the Sahara is full of them, especially the Fezzan and Cufra Oases. These, however, go back to the time when this great country was steppe, and even forest-covered in some places—when the rainfall was plentiful.

From Garian I went with the pay truck to Nalut. The road is good as far as Giado where we came down the Gebel escarpment to follow the edge of the plateau and there it degenerates into a mere desert trail. A few miles before Nalut we came again upon the plateau, on the very edge of which the town is situated. The desert on the highlands is far more advanced than on the lowlands; the *wadis* are fewer because many of them owe their origin to water seeping down the canyons. The esparto grass growing much before Giado gives way to imperita grass, and this has a deader appearance. Imperita grass is used frequently to control the shifting sand dunes by planting it in

ABOVE: *Berber settlement right below the Gebel escarpment, near Giado, Tripolitania. The cliffs are nearly 1,500 feet high.*

MIDDLE: *A Berber in Nalut, Tripolitania.*

BELOW: *Within the walls of the Berber castle at Nalut.*

squares atop and on the sides of sandy hills. Such dunes are a constant menace here; parties of Arab workers are always present along the road. It is, moreover, a man-made desert. There are relics of forests along the escarpment. Some of the ancient writers like Herodotus and Strabo speak of forests with many wild animals inhabiting them along the Gebel. The Romans tried to stop erosion by erecting walls across the valleys but their efforts came to naught. They cut the forest without replacement, with the result that rapid erosion proceeded to devastate the arable land in the Emporia, as this colony was then called. The upheavals of the late Roman empire further undermined the social structure and hence cultivation of the land, and the Arab invasion brought back nomadic habits. The complicated business of irrigation was abandoned to the winds, and erosion plus the lack of a water source created a desert where once rich farmland existed even as far as 100 miles inland.*

Now constant watch must be exercised over the road; we passed many a place where half its width was covered with red or yellow sand. Here and there we stopped to pay off the Arabs who work on the road two weeks at a time, at 50 cents a day. Wherever we halted at an Arab encampment flies swarmed over us in droves. One cannot blame the Arabs for their filth. There isn't water enough to supply their stock, let alone for the maintaining of human cleanliness.

But these sorry reflections were compensated for by the scenery. The whole Gebel escarpment is one of the most impressive sights I know. All along, deep canyons cut far into the upland with walls almost 1,500 feet high. In beautifully exposed strata the red, pinkish, and occasionally purplish rocks descend very much as if in a somewhat lesser Grand Canyon. Remove the date palm and you'll think you are at home in Arizona. It would have been no surprise had aquiline Navajo faces appeared instead of red Arab fezzes.

Smaller gullies run up the walls of the main canyons, and in them to more than half their height tiny Arab terraces climb like steps, each holding a small cultivated field, with usually a date palm or an olive tree. Their sides are fortified with stone to prevent falling off of soil and too rapid run-off of water. The palms stand out like single, waving feathers. The canyons open up into the great plain which vanishes into the haze 100 miles toward the sea.

And so we came in the afternoon to Nalut. This thoroughly Berber settlement is situated at the very western end of the Tripolitanian Gebel. In the Fascist era a great many Italian troops were stationed here, as witnessed by the many barracks, now in ruin. Today, one English officer and three or four Italians comprise the non-Berber population. The old Nalut is perched on the southern side of the canyon which runs up the hill, while on the other side is a single building looking much like a watch tower. In its day this must have been quite impregnable—when warfare was not mechanized. The characteristic Berber houses are dominated by the castle, which is really a great food depository; each family had its own niche where grain was stored in case of war. It is still used for this purpose. There are evidences of long continued occupation by a considerable population.

The Nalut Berbers themselves seem to be physically different from what is supposed to be the typical Berber. All those I saw were of dark complexion and black-eyed. I suspect this must indicate the outer fringe of Berber distribution where the Arab invaders overwhelmed the endemic population physically but took in return its language and customs.

By the time I finished roaming around the settlement the sun had gone. I looked into the canyon; it slowly sank in twilight. Voices came across it from the settlement and a few lights flickered. There was calmness and lovely shadows lay on the steep mountainside. Here there was at last the solitude and the quiet of desert which has moved many a human mind to contemplation of tranquility, out of which have come many of the religions professed today by civilized men. I stood there for a while on the balcony of my hotel, until suddenly supper was announced.

Unfortunately my time in Nalut was all too brief, and the following morning I had to return to Garian.

COMING BACK from the plateau trip we touched Jefren. Here the Italians left a still greater number of barracks and houses, this time in good condition. Berbers had moved in and promptly filled the windows and doorways with odd bricks, leaving but tiny openings for windows as in their own ancient dwellings. Here is persistence of old custom in the face of entirely new conditions.

There was still a trip to Misda lined up but this came to nothing. Soon after I returned to Garian frantic telephone calls from the police and the American Consulate in Tripoli demanded the delivery of one Malkin "dead or alive" pronto to Tripoli. Down I went. It appeared I had forgotten to register with the police as per regulation when I disembarked from the *Cellio*, which made me a dubious character—more so that no one was able to figure out just what I've been doing all this time in Tripolitania anyway.

So ended my Tripolitanian adventures; but it was time to go on to Tunis and Algeria. From Alger I will start the long bus trip south across the Sahara to Nigeria. My next letter should be from Lagos. Yours,

BORYS

*Cf. Fairfield Osborn, *Our Plundered Planet* (1948), pp. 111-115 (reviewed in *PD*, July-August 1948); and William Vogt, *Road to Survival* (1948), pp. 240-253 (reviewed in this issue.)—ED.

Of TIME and Survival

A. STARKER LEOPOLD

THE NATURAL RESOURCES of the world are bountiful indeed, but they are not boundless. Two recent volumes have pondered the relation of man to the earth's inherent wealth, particularly to the food producing soils. Fairfield Osborn's *Our Plundered Planet* (reviewed in the July-August issue of *Pacific Discovery*) raises a disturbing question. William Vogt's *Road to Survival** states it even more emphatically. The question: how long will our agricultural soils last under the increasing demands imposed by a rising world population? According to both of these authors, crop lands are deteriorating rapidly throughout the world, while at the same time the human population is skyrocketing. It behooves us, they warn, to undertake some serious land-use planning on a global scale.

That the world is not ready to accept such planning is indicated by *Time Magazine's* blistering attack on Vogt in particular, and, while they are at it, on all others who display any pessimism or doubt about the future of mankind (*Time*, November 8, 1948). What are the bases of Vogt's pessimism and of *Time's* optimism?

Vogt approaches the problem from an ecological rather than a technological point of view. He suggests that land has a "carrying capacity" for human beings just as it has for wild animals or domestic livestock. Under the very best of management the land surface of the earth will be able to support only so many people, Chambers of Commerce notwithstanding. When the human population exceeds this carrying capacity (as it now does in India, parts of Latin America, etc.) the soil resources must of necessity be overtaxed to maintain the excess population. Such soil "mining" leads to erosion and progressive loss of fertility with a consequent decline of carrying capacity and ultimate famine. *Road to Survival* elaborates this idea and clothes it with evidence drawn from all parts of the world, particularly from Latin America where the author has studied problems of resource conservation for the last ten years.

Two obvious corollaries follow from Vogt's basic premise. (1) We must undertake throughout the world a planned program of land use so that nowhere will soils be allowed to deteriorate through overuse. Famine in one country cannot indefinitely be alleviated by exploiting the soils of another (e.g., currently being exploited, the U.S.). And (2), by education and other means the increase in human populations will have to be curbed to conform to what the land will support on a sustained yield basis. We labor to spread the benefits of public health—to save lives, but we ignore the accelerated production of more lives, which means still more mouths to feed.

Even if everyone agreed with Vogt's ideas, the difficulties in implementing them are infinite. Planning world agriculture and limiting the earth's human population are tasks of staggering dimension. Yet Vogt states openly that whether we like these dictates or not, whether they are easy to follow or difficult—they alone point the road to survival.

And of course everyone does not agree, as *Time* makes abundantly clear. Industrial man has become so apparently independent of nature, so confident of his science and his technology, that he has come to feel emancipated from natural laws. The editors of *Time*, for example, compiled an array of evidence proving that poor subsoil under intensive culture and heavy fertilization could be made to grow crops. Therefore why worry? When we wear out our present topsoil we will make a new batch. The more men there are in the world, the more "hands" there will be to work in the fields growing food for the "hands" that work in the factories where machinery is made to till the fields, and so on. Cat-and-rat-farm logic!

Such cheerful whistling in the dark ignores the broad outlines of the problem as Vogt defines it.

NOTE—to *Time's* editors, and everyone with concern for human survival: Highly pertinent to the present discussion is an article entitled "On Living in the Biosphere" (*Scientific Monthly*, December 1948), by a very reputable scientist, Professor G. E. Hutchinson of Yale University. Quote: "Anyone with any technical knowledge understands that the dangers described in these [Osborn's and Vogt's] book are real enough, more real and more dangerous perhaps than the threat of an atomic world war." (p. 396.)—EDITOR.

*Road to Survival. By William Vogt. William Sloane Associates, New York. 1948. xvi + 335 pp. Maps, graphs, diagrams. $4.00.

In the first place, the economic structure of the world is geared to cheap production of food, wood, cotton, wool, etc., on land that is inherently rich. That is the source, and the only source, of our material wealth. Even if we could "build" the soils to grow these necessities, the cost would be staggering and inevitably would result in drastically reduced standards of living for everyone. There is, moreover, the question of whether it could be done at all. Soil rehabilitation requires adequate water and fertilizers of many kinds, some of which are in very short supply. Vogt points to the shortage of usable water as one of the world's most critical current problems. Every forested hillside that is being cleared for crops marks a decrease in the water supply. Certain fertilizers such as phosphates, essential to plant growth, are so rare on the earth's surface that we scarcely have enough to maintain our present topsoils. The only significant phosphate deposits so far known are in the United States and in Algeria. (Parenthetically, it is said that one of Hitler's objectives in invading Africa was access to the Algerian phosphates). In view of these shortages, *Time's* idle prattle about converting into verdant gardens the worn out subsoils of the world and additional great areas of forest as well, is wishful thinking indeed. To rebuild the soil on a few experimental acres in a land of plenty is no trick at all. But to assert therefore that we can apply the technique to the whole world is quite another story.

To an American who has seen only the lush acres of our young country, the concept of "ruined land" is unfamiliar and perhaps a little improbable. Most of our tilled soils are in early stages of erosion and still reclaimable. The best nearby examples of what Vogt hopes to avoid (i.e., land eroded beyond salvation) occur in parts of Mexico that have been excessively tilled for 450 years or even longer. (There are some who believe that serious erosion started in the Aztec Empire long before the Conquest). An American tourist approaching Mexico City from the north passes through a series of low hills covered with desert-like vegetation. They were not always so. As late as 1800 Alexander von Humboldt described the pine forests on the higher knolls—the lower slopes already were cleared—and such place names as "El Carbon" and "La Vega" bespeak an original richness of timbered uplands and intervening tilled valleys. Population pressure forced the cutting of the forests and cultivation of the slopes until all the topsoil was gone and the bottomlands were gutted by transverse gullies. Now this area is worthless and deserted. The present ground surface is the original hardpan of rock-like *tepetate* which rings like concrete when a loose rock is dropped. This is but one pin-point example of ruined land—land which may be measured today in billions of acres over the surface of the earth. By no alchemy or science can such land be restored to productivity.

Let us not be deceived by the blind optimism of *Time Magazine* or others who would not admit the magnitude of the land-use dilemma. Contrary to *Time's* implication, we have not even begun to solve the problem of soil conservation in our own country, and this must occupy us first. Beyond our national boundaries the drain on soils is still more acute. Even now we are shipping our excess foodstuffs throughout the world in an effort to sandbag the widening gulf between global food supplies and food demands.

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HERMON CAREY BUMPUS, YANKEE NATURALIST. By Hermon C. Bumpus, Jr. University of Minnesota Press, Minneapolis. 1948. 141 pp. $2.50.

Hermon Carey Bumpus, after fifteen years of distinguished teaching of zoölogy, first at Olivet College and later at Brown University, became successively director of the American Museum of Natural History, business manager of the University of Wisconsin, and president of Tufts College. As trustee or in other official capacity he was prominently connected with the Woods Hole, Cold Spring Harbor, and Mt. Desert biological laboratories, served as a member of the board of fellows and secretary of the corporation of Brown University, was consulting director of the Buffalo Museum of Science, and chairman of the educational advisory board of the National Park Service.

This biography will interest not only the many people who knew Dr. Bumpus personally or by reputation, but all who enjoy reading the story of a lively, energetic, warmly human personality. Of particular interest to western readers is the account of the development by Dr. Bumpus, in collaboration with Herbert Maier, Carl P. Russell and others, of trailside museums in the national parks.

ROBERT C. MILLER

California Academy of Sciences
San Francisco

AMPHIBIANS AND REPTILES OF THE PACIFIC STATES. By Gayle Pickwell. Stanford University Press. 1947. xiv + 236 pp., 64 half-tone plates, 20 text figs. $4.00.

This comprehensive work of large format for naturalists, students, and laymen, issued a year ago, was not reviewed here earlier because of the difficulty of finding a prominent Western herpetologist reviewer not generously credited by the author with a share in its preparation. The descriptive text is fascinating reading; the author's photographs are characteristically excellent; the Keys to the Amphibians and Reptiles are technically detailed but not beyond the serious student. Glossary, Bibliography, and Index round out this, another of many books by one of the West's best known naturalists.

GOLDEN GATE, *The Park of a Thousand Vistas.* By Katherine Wilson, with illustrations by the author. The Caxton Printers, Ltd., Caldwell, Idaho. 1947. 143 pp., 16 pencil drawings, map. $3.50.

History and description of San Francisco's world-famous park. A detailed guidebook in content if not in format. Getting a good grip on her subject, the author wrote with knowledge, charm, and—happily—with not more than a dash of rapture. Her drawings are lovely, although a few a bit thin; this, however, is the kind of book that needs excellent photographs. For all that, this Idaho publisher is to be thanked for giving San Franciscans the best recent book on their own Golden Gate Park.

CALIFORNIA LANDMARKS; *A Photographic Guide to the State's Historic Spots.* Text, maps, and photographs by James D. McClure. Stanford University Press. 1948. xvi + 149 pp. $3.00.

Stanford University's director of photography has poked a skillfully selective camera into every corner of California. The result is more than just an album of over 100 photographs of historic places and things. Mr. McClure's text and maps (genuine cartography, not mere sketching) make this a very useful field guide and reference. The offset presswork is commendably clean and sharp on all type pages, most half-tones.

SEEING CALIFORNIA; *A Guide to the State.* By Blair Tavenner. Little, Brown & Company, Boston. 1948. 494 pp., 16 photographs. $3.50.

In pocket-guide format the author, who lives in New Jersey, has given fellow travelers-to-California more useful information than they are likely to find between any other two covers. First chapter: a synoptic history of the state. From there on, local details of fact and legend are nicely worked in with how to get from here to there, what to see, and where to eat and sleep. The book's many errors (few in ratio to total amount of information given) do not lessen its worth; they are mainly owing to the fact that it is impossible to have everything up to date all at once just before going to press. This guide should become standard, and errors will creep out in successive editions.

YOSEMITE TRAILS AND TALES. By Katherine Ames Taylor. Stanford University Press. 1948. 95 pp., 2 maps, 20 photographs by Ansel Adams. Paper, $2.50.

Adding little that is new to popular Yosemite guide and lore literature, this well printed little book retells the familiar most pleasantly. For all who are just discovering Yosemite it has the things they'll want to know; for others it is a keepsake of Adams' classic photographs meticulously reproduced.

Look at America: THE FAR WEST. By the Editors of *Look*, with an Introduction by Joseph Henry Jackson. *Look at America Series.* Houghton Mifflin Company, Boston. 1948. 402 pp., maps, photographs in color and half-tone. $5.00.

"A handbook in pictures, maps and text for the vacationist, the traveler and the stay-at-home," it says on the title page. Adding "for the naturalist, and everyone interested in his physical environment who lives in Washington, Oregon, or California," we would say this is a veritable pocket encyclopaedia of pictorial information. That so many of the photographs (of which this book largely consists) are beautiful is a credit first to nature then to the taker and finally to the printer (in this gravure job, the pictures are nearly perfect, the type fuzzy but not weak)—but why, in the lovely color section, aren't the redwoods red?

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ERRATA in the September-October 1948 issue:

Page 14. *For* Encyclopaedia Brittanica *read* Encyclopaedia Britannica.

Page 23. In caption under picture of bottle tree, *for* coffee *read* cocoa.

Page 30. In review of *The Trees of Yosemite, for* Mary Curry Tressider *and* Mrs. Tressider *read* Mary Curry Tresidder *and* Mrs. Tresidder.

PD's apologies to the Britannica, to the cacao family, and to Mrs. Tresidder.

The Editors are most anxious to have errors of fact or spelling brought to their attention in time for correction in the subsequent issue.

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